Space Weather Forecast

Issued on Monday, 03 October 2022 at 01:31 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor-Moderate storms Day 1 and Day 2. Ongoing likelihood of Moderate flares with chance of Strong flares due to two notable sunspot groups.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Strong over the last 24 hours, with a both a Strong and a Moderate flare observed from a small but complex sunspot region in the northwest disc. This region is still developing. Moderate flares were also observed from a much larger region which is more of a long string of sunspots, in the northeast. This also is complex, with the potential for further development. In total there are eight sunspot regions on the disc, however the other regions are small and simpler.

In the last 24 hours, two potentially Earth-directed CMEs (coronal mass ejections) have been observed leaving the Sun, due to the observed flares. The strong flare sourced CME has yet to be analysed, with the Moderate flare one likely missing but with a chance of a glancing arrival on the 4th. These CMEs may combine with those already en-route that were observed leaving the Sun on the 1st.

Solar Wind / Geomagnetic Activity: Solar wind speeds have shown Earth entering the faster winds from a coronal hole. These have rising from around 400km/s to be elevated at 550-600 km/s. The magnetic field strength was mostly weak at 5-8nT, but climbed to moderate levels at 02/2000 UTC, likely in response to the fast wind onset. The north-south component became moderately negative (southward) at this time. The resultant geomagnetic activity was mainly Quiet to Unsettled (Kp 0-3), but rose to G1/Minor Storm (Kp5) at 03/2100-0000.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is currently just above normal background levels and easing in response to the recent Strong flare, but well below the S1/Minor Storm threshold.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be Moderate to High, with flares likely from the large region in the northeast and the region in the northwest.

Solar Wind / Geomagnetic Activity: There are potentially four CME's in which could influence Earth all from near the sunspot group in the northwest. The first, which left the Sun on the 1st, will potentially arrive late on day 1 (3rd) or early day 2 (4th), although this low confidence with a glancing impact possible. Further CMEs follow, however these are lower confidence for arrival, but may combine with the first arrival to give further enhancement through day 2 (4th). The uncertainty around these CMEs gives very low confidence in the forecast. Otherwise current fast winds are expected to only gradually ease day 3 and day 4 (5th and 6th), becoming slightly elevated by the end of the period. Geomagnetic activity is forecast to be mainly Unsettled to Active day 1 (3rd) with G1-G2 Minor to Moderate Storms possible at first, and then a further chance of G1-G2 (Minor to Moderate storms) either late day 1 or early day 2 (3rd-4th) with any CME arrival, perhaps ongoing into day 3 (5th) with any CME arrival. Otherwise, a general trend

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back towards Quiet, with isolated Unsettled intervals is expected later day 3 and day 4 (5th-6th).

Energetic Particles / Solar Radiation: The count rate of energetic particles is expected to be near or at background but with a chance of rising at times due to any further flaring from the notable sunspots. This giving a slight chance of reaching the S1/Minor Storm threshold.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	60	50	20	5
Strong	G3	No	15	15	1	1
Severe	G4	No	2	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	75	75	70	70
Very Active	R3 to R5 X	Yes	25	25	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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